

Balance Model for Finding Variables!

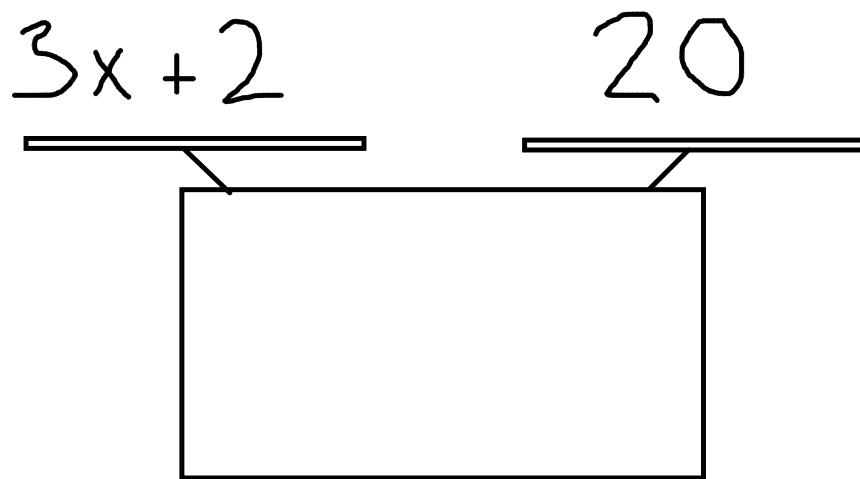
BEFORE when we had  $3x+2=53$ , we had to either

- Trial and Error
- Think about how "something" + 2 = 53, and that is 51, so 3 times something is 51.....

Some felt this was a little too much guessing.

# AND SO, the balance model.

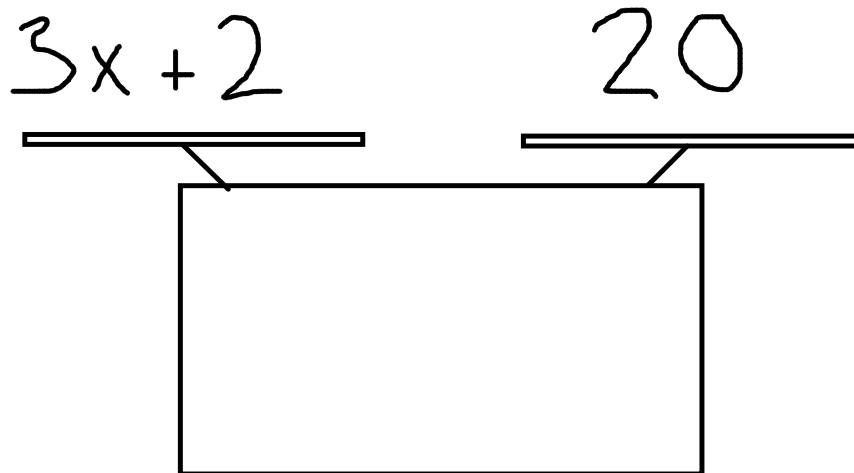
Imagine we have a balance. It is important that we keep it level and balanced. That means ONE THING. WHATEVER we do to one side, we do to the other as well.



What we need to do is get X on a side by itself. Then whatever is on the other side is what X is equal to.

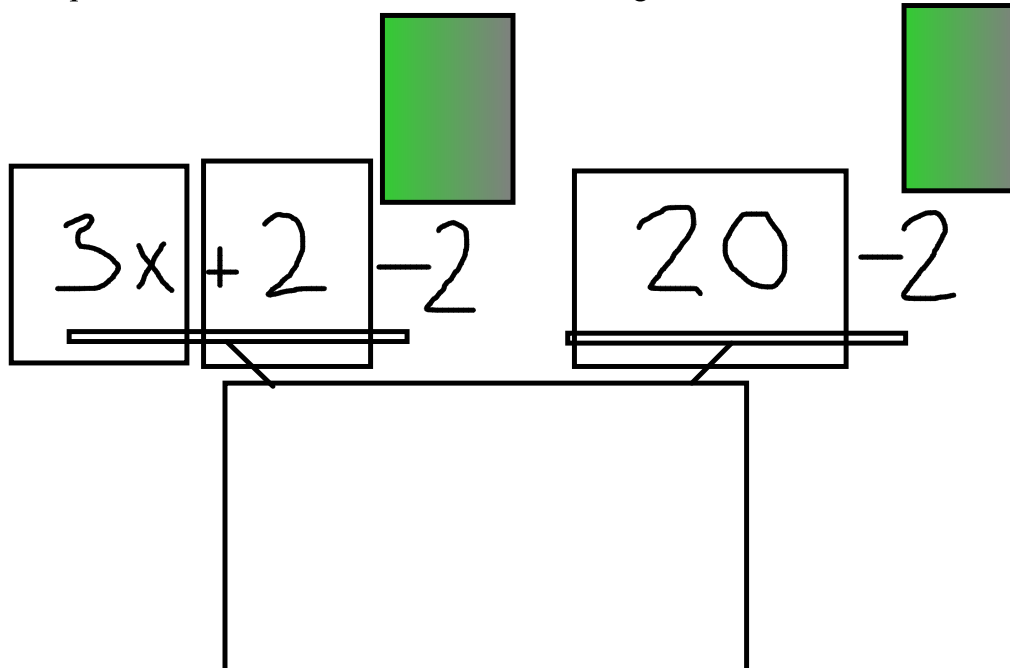
So how do we get it by itself?.

First we figure out the TERMS. Each TERM includes the value and the operation.



Now that we know the terms, we need to get X by itself.

First step. Get rid of that +2 Term. What could get rid of a +2?



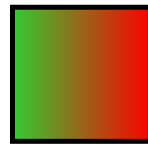
$$\frac{3x}{2} + 2 - 2 = 0$$

$$\frac{20}{2} - 2 = 18$$

What undoes a TIMES 3?



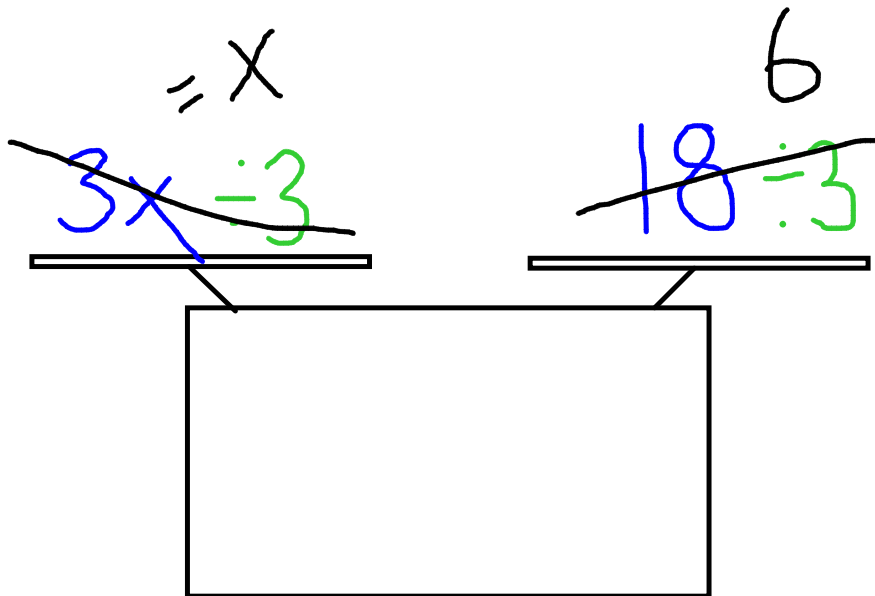
$$3 \times \div 3$$



$$18 \div 3$$



X is on one side, 6 is on the other, and it stays balanced (because we did the same thing to both sides) THEREFORE,  $X=6$ !





So treat the EQUALS SIGN (=) as if it is a balance, doing the same thing to EACH side, to get the variable by itself on one side. This is called ISOLATING the variable.

Try it!

$$\begin{array}{l|l} & 13x - 7 = 58 \\ +7 & 13x - 7 + 7 = 58 + 7 \\ & 13x = 65 \\ \div 13 & 13x \div 13 = 65 \div 13 \\ & x = 5 \end{array}$$

So try one on your own...

$$12x + 17 - 8 = 153$$

$$\begin{array}{l} \phantom{-9} \phantom{\div 12} 12x + 9 = 153 \\ -9 \phantom{\div 12} 12x + 9 - 9 = 153 - 9 \\ \phantom{\div 12} 12x = 144 \\ \div 12 \phantom{\div 12} 12x \div 12 = 144 \div 12 \\ \phantom{\div 12} x = 12 \end{array}$$

THE BEST part about this is that you can check your answer! Just sub your answer in for x.

so for

$$\begin{array}{l|l} & X+7=10+15 \\ & x+7=25 \\ -7 & x+7-7=25-7 \\ & x=18 \end{array}$$

Check!

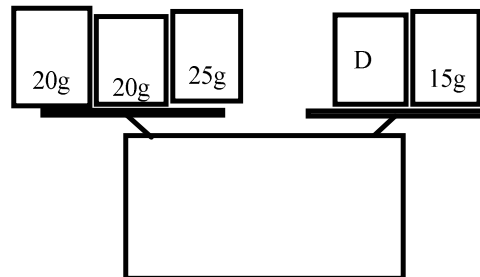
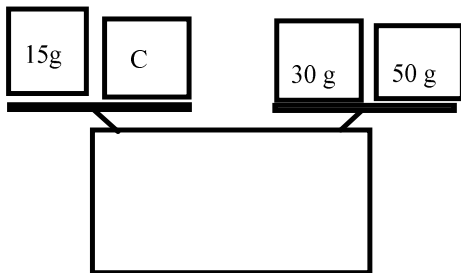
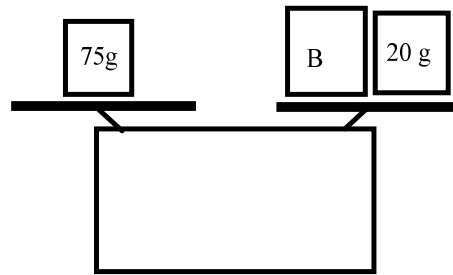
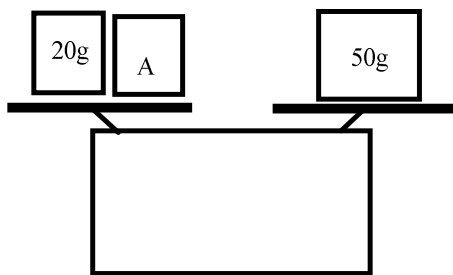
Left Side  
 $X+7=18+7=25$

Right side  
 $10+15=25$

They MATCH! So we are right!

Homework:  
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Find the value of the unknown mass on each two-pan balance.



Solve Each Equation

a)  $x+3=5$

b)  $x+5=10$

c)  $x+10=17$

d)  $x-3=5$

e)  $x-5=10$

f)  $x-10=17$

Solve each equation. VERIFY the solution.

a)  $3+x=5+9$

b)  $x-3=11-8$

c)  $4+7=x-8$

d)  $21-13=7+x$

Five more than a number is 24.

Let  $x$  represent the number.

Then an equation is  $5+x=24$ .

Solve the equation.

What is the number?



